April 8, 1958 F. D. PATTI 2,830,157

TEMPERATURE RESPONSIVE ELECTRIC SWITCH

Filed Aug. 14, 1956

Fig. 1.

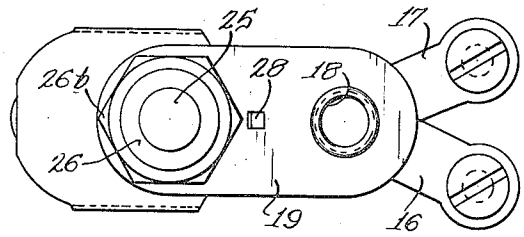


Fig. 2.

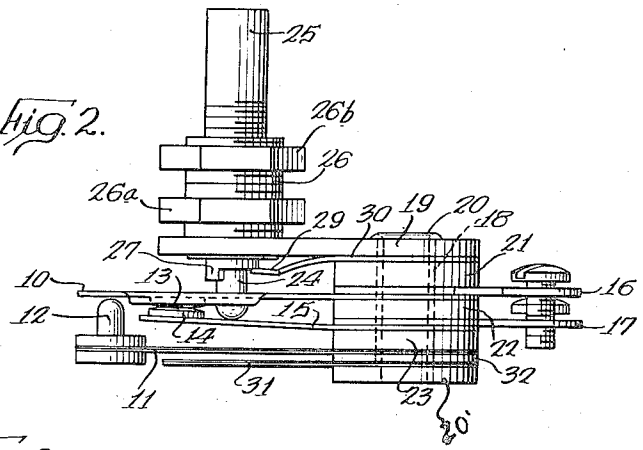


Fig. 3.

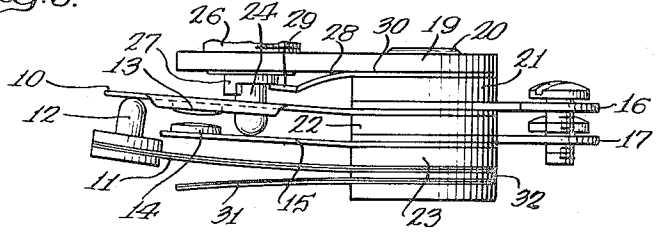
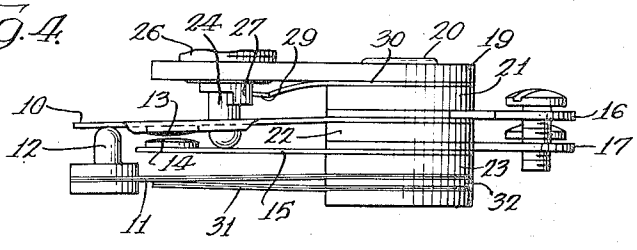


Fig. 4.



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United States Patent Office 2,830,157 Patented Apr. 8, 1958

2,830,157

TEMPERATURE RESPONSIVE ELECTRIC SWITCH

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Application August 14, 1956, Serial No. 603,900

6 Claims. (Cl. 200—138)

The present invention relates to a temperature responsive electric switch and more particularly a switch of this type embodying novel means for controlling positive separation of the contacts at temperatures below the selected low temperature limit of the operating temperature range.

It is the general object of the present invention to provide a novel and useful switch of the character indicated which is extremely simple in construction and operation, and may be economically manufactured, while at the same time having great durability and reliability under the most severe operating conditions.

Other and further objects, features and advantages of the present invention will be apparent to one skilled in the art from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is an elevational view of a switch embodying the features of this invention taken from the side of the switch from which the operating shaft projects.

Fig. 2 is a similar view with the operating shaft projecting downwardly and showing the contacts of the switch in "on" position.

Fig. 3 is a fragmentary view similar to Fig. 2 showing the contacts of the switch in "off" position in response to deflection of the thermostat blade toward the high temperature end of its operating range as determined by the rotated position of the operating shaft.

Fig. 4 is a similar view showing the switch contacts in open or "off" position in response to movement or deflection of the thermostat blade at the limit of its movement in a cooling direction beyond the lower temperature end of its operating range.

A temperature responsive electric switch representing a preferred embodiment of the present invention, as shown in the drawings, includes a resilient switch arm or blade **10**, a resilient thermally responsive actuator blade **11** of a bimetallic material having a desired displacement versus temperature characteristic from ambient or room temperature all the way to the high end of the desired operating temperature range, and a button **12** of insulating material carried by an end portion of the blade **11** toward which button the blade **10** is resiliently biased so that the button **12** is capable of engaging the blade **10** at a given position corresponding to normal or room temperature or alternatively engaging said blade to retain the same in a different position between said normal or room temperature position and the high end of its temperature operating range. The blade **10** carries a contact **13** which cooperates with a contact **14** carried by a second resilient switch arm or blade **15** supported intermediate of said contact blade **10** and the actuator blade **11** of bimetallic material. A metal terminal member **16** in conductive engagement with the contact blade **10** and a similar terminal member **17** in conductive engagement with the contact blade **15** provide means for establishing a connection with the electrical circuit to be controlled by the engagement and disengagement of the cooperating contacts **13** and **14**.

Each terminal member **16** and **17** and the contact

blades **10** and **15** respectively associated therewith have eyelet-shaped ends which are disposed around a tubular supporting fastener or post **18**. One end of the post **18** is staked or otherwise suitably fastened through an opening in a rigid bracket **19** as at **20'**. The opposite end of the post **18** is provided with an enlarged head **20** and a series of insulating spacers or bushings **21**, **22** and **23** fitted about the post **18** and with which the blades **10**, **15** and **11** and members **16** and **17** are interleaved as shown in the drawings, cooperate to secure the blades **10**, **15** and **11**, the members **16** and **17** and the bracket **19** in stacked, insulated relation with the contacts **13** and **14** in aligned relation along an axis in spaced parallel relation to the post **18**.

The second contact blade **15** is resiliently biased toward the blade **10** and against an insulating tip or stop **24**. The stop **24** extends through an opening in the blade **10** and forms the forward or inner extension of an operating shaft **25** which has threaded engagement with an internally threaded nut **26** fixed to the bracket **19** in coaxial alignment with and surrounding an opening in the bracket **19** at a distance away from the post **18**. The nut **26** has a threaded external surface engageable by an outer mounting nut 26^a and an inner mounting nut 26^b whereby the switch may be supported on a panel or other suitable supporting member by tightening the outer nut 26^a against the outer surface of such a panel while the surface of the inner nut 26^b facing the nut 26^a engages the inner surface of the panel. Thus the bracket **19** may be mounted on a fixed panel or support by means of a suitable fastener having entry through the tubular post **18** or by means of the shaft **25** in cooperation with the mounting nuts 26^a and 26^b.

By means of a knob or other suitable finger engaging handle (not shown) fitted on the outer end of the shaft **25** opposite the end carrying the tip or stop **24**, the shaft **25** may be rotated and because of the threaded interengagement of the shaft **25** and the nut **26**, and through such rotation of the shaft **25** the stop will be moved axially whereby the limit position of the second contact blade **15** and its associated contact **14** may be adjusted as desired. A dog **27** forming an axial extension of the end of the shaft **25** facing the contact blade **10** has engagement with a tongue **29** forming a reduced extension of a leaf spring **30** secured about the post **18** between the bracket **19** and the surface of the insulating spacer facing said bracket **19**, to limit the rotation of the shaft **25** to an arc of desired distance less than one complete revolution. Thus in one limit of rotation of the shaft **25**, as shown in Fig. 4, the contacts **13** and **14** of the blades **10** and **15** are in "off" position in response to the stop **24** being located in its most advanced position relative to the plate **19**.

In a less advanced position of the stop **24** as shown in Fig. 2 and Fig. 3, the blade **15** is allowed to occupy an inclined position toward the bracket **19** with the result that the contacts **13** and **14** are in engaged or "on" position as in Fig. 2 and the bimetallic blade **11** has not yet assumed a position of deflection sufficient to move the blade **10** in the direction of the bracket **19**. At the high operating temperature of the range determined by the position of the stop **24**, as in Fig. 3, the bimetallic blade **11** has undergone sufficient deflection to move the blade **10** a distance wherein the contacts **13** and **14** are in disengaged or "off" position.

The tongue **29** of the leaf spring **30** applies sufficient friction against the annular end surface of the shaft **25** engaged by the tongue **29** to yieldably hold the shaft **25** against accidental or unintentional rotation from a selected adjusted position of the dog **27** relative to said tongue **29**. An ear **28** sheared and bent out of the plane of the

spring 30 interengaged with an opening in the bracket 19 aligned therewith provides means for locking the spring 30 against displacement about the post 18 as an axis.

Reference numeral 31 desginates a second resilient thermally responsive actuator blade of bimetallic material having an eyelet shaped end portion fitting about the post 18 and held in stacked relation to the actuator blade 11 between a conductive spacer 32 engaging the clamped face of the blade 11 facing the head 20' and surface of the head 20' facing the blade 11. The blade 31 is arranged to present its metal layer of greatest thermal expansion in facing relation to the blade 11 with the result that the blade 31 will be deflected away from the blade 11 under the influence of increasing temperature, as in the position of the parts shown in Fig. 3 wherein the blade 11 is operative to move the contact blade 10 a sufficient distance away from the contact blade 15 to place the contacts 13 and 14 in "off" position. As the temperature decreases and approaches a normal or room temperature, the blades 11 and 31 will assume a parallel position as shown in Fig. 2 and finally upon further cooling of the blades 11 and 31, they will move into interengaged position as shown in Fig. 4 wherein the blade 31 is effective to limit further deflection of the blade 11 in a cooling direction. It will thus be seen that by using blades 11 and 31 of bimetallic material having substantially equal displacement versus temperature characteristics, such interengagement will take place on a line parallel to and midway of the space between the blades 11 and 31 when the blades 11 and 31 are in such spaced apart relation as shown in Fig. 2. It will also be observed that such positive control of the deflection of the blade 11 in a cooling direction positions the contacts 13 and 14 relatively close to the position of the contacts when the latter are at a station corresponding to the lower end of the operating temperature range.

In accordance with the present invention as described and illustrated herein, provision is made for a temperature responsive electric switch construction and design having a positive "off" position and minimum amount of lost motion in the adjusting mechanism thereof between its "off" position and the low end of its desired operating range of adjustment.

It will also be understood that minor variations and changes in the exact details of construction will be apparent to persons skilled in the art of thermal switches and accordingly it is intended that this invention shall cover all such changes and modifications as fall within the scope of the claims appended hereto.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. A temperature responsive electric switch assembly

having two relatively movable switch blades, cooperating contacts carried by said blades for completing a circuit through said blades, a resilient thermally responsive actuator blade operative to control the position of one of said switch blades to engage and disengage the contacts in response to predetermined variations from a selected operating temperature, a rigid support on which said switch blades and said thermally responsive blade are fastened in stacked relation with said thermally responsive blade and the switch blade controlled thereby in straddling relation to the other switch blade, and means obstructing movement of said thermally responsive blade in a direction away from the switch blade controlled thereby under predetermined temperature conditions including a second resilient thermally responsive blade secured to said support in opposed relation to the surface of said first thermally responsive blade which faces away from the area occupied by said switch blades.

2. A switch assembly as defined in claim 1 wherein the thermally responsive blades are in clamped stacked relation at one end thereof, and a spacer separates said thermally responsive blades at said clamped end of the blades.

3. A switch assembly as defined in claim 1 wherein each thermally responsive blade has a displacement versus temperature characteristic similar to that of the other thermally responsive blade.

4. A switch assembly as defined in claim 1 wherein an insulating member carried by said first thermally responsive blade is operable to move the switch blade controlled by said first thermally responsive blade in a direction away from the other switch blade.

5. A switch assembly as defined in claim 1 wherein the switch blade straddled by the first thermally responsive blade and the switch blade controlled by said first thermally responsive blade is resiliently biased into engaged position with an insulating member forming an extension of a threaded operating shaft rotatably mounted about a fixed axis in relation to said support.

6. A switch assembly as defined in claim 5 wherein rotation of the shaft is controlled by a leaf spring secured about said rigid fastening member between the bracket and the switch blade nearest said bracket, and means for locking the spring against displacement about said fastening member as an axis includes an ear on said spring interengaged with an opening in said bracket.

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